

HP

RESEARCH DEPARTMENT

**U.H.F. TRANSMITTING AERIAL FOR THE WINTER HILL
TELEVISION STATION**

Technological Report No. E-114/15
(1965/45)

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for Head of Research Department

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U.H.F. TRANSMITTING AERIAL FOR THE WINTER HILL TELEVISION STATION

INTRODUCTION

A u.h.f. transmitting aerial for the South Lancashire area has been built on the support column of the new 1,000 ft (305 m) ITA mast at Winter Hill. The aerial came into operation with trade transmissions on 10th October 1965 and started full service on 31st October 1965.

SUMMARY OF INSTALLATION

- Site:** The site is 5 miles (8 km) north-west of Bolton, grid reference SD/660 149, height 1,437 ft (438 m) a.m.s.l.
- Support Structure:** The support structure is a 1,000 ft (305 m) stayed mast. Up to a height of 650 ft (198 m) the mast is cylindrical with a diameter of 9 ft (2.75 m) and this section is equipped with a lift. Above a height of 650 ft (198 m) the cross-section is triangular with a side of 6 ft 6 in. (1.98 m) up to a height of 850 ft (259 m) and triangular with a side of 4 ft 3 in. (1.30 m) above this height. The mast stays, which are attached to the corners of the triangular sections, are on bearings of 101°, 221° and 341° ETN.
- General Arrangement:** See Fig. 1.
- Channels:** The aerial is designed to radiate on the two BBC channels, 55 and 62, of which the latter is to be used for the opening service (BBC-2). Channel 62 has positive offset and Channel 55 will have negative offset.
- Aerial:** The aerial comprises eight tiers each of six 5λ panels fed with equal co-phased currents, giving a total radiating length of 39.3λ at Channel 52 and 42.3λ at Channel 62. The panels are mounted in pairs on the faces of the support mast and are protected from the weather by a 9 ft (2.76 m) diameter glass-fibre cylinder. Fig. 2 shows the arrangement

of the panels on the mast and Fig. 3 shows the construction of each panel.

The mean height of the aerial is 965 ft (294 m) a.g.l.

Feeders: The arrangement of the distribution feeder is shown schematically in Fig. 4. Each half of the aerial is connected to the transmitter by a feeder type F & G 6 1/8 - 50.

Power: Two 12.5 kW vision transmitters and two 2.5 kW sound transmitters will be provided for each channel; at present only those for Channel 62, manufactured by Pye, have been installed. Each transmitter will be run at the power required to give the maximum effective radiated power (e.r.p.) permitted under the Stockholm Agreement, namely 500 kW.

The service has opened with one vision and one sound transmitter fed into each half aerial but at a later date a diplexer and splitting transformer will be added to eliminate differences between the modulation characteristics of the vision transmitters. Similarly, a two-channel combining unit will be added later, as required.

Templet and horizontal radiation pattern (h.r.p.):

The h.r.p. was required to be omnidirectional with a maximum e.r.p. not exceeding 500 kW. The specified tolerance on the h.r.p. uniformity was ± 2 dB. The h.r.p.s at the vision carrier frequency of each operating channel, which are shown in Figs. 5 and 6, are the mean of measurements on each half of the full-scale aerial.

Vertical radiation pattern (v.r.p.):

The v.r.p. was specified to be gapfilled with the maximum of radiation tilted 1.2° below the horizontal; this is achieved by means of a phase distribution of the feed currents over the length of the aerial. The v.r.p.s obtained for each face, shown in Figs. 7 - 9, were computed from measurements of the amplitudes and phases of the feeds to the aerial panels, taken after erection.

Gain:

Channel	55	62
	dB	dB
Mean intrinsic gain	16.1	16.0
<u>Deduct losses:</u>	dB	dB
Gapfilling	0.7	0.7
Distribution feeder	0.2	0.2
Distribution transformers	0.1 1.0	0.1 1.0
Mean net gain	15.1	15.0

Deduct losses:

Main feeder, 1,020 ft (311 m)	2.1	2.1
Feeder ground run, 40 ft (12.2 m) rigid copper	0.2	0.2
Diplexer	0.1	0.1
Splitting transformer	0.1 2.5	0.1 2.5
Mean effective gain	<u>12.6</u>	<u>12.5</u>
H.R.P. maximum/mean ratio	<u>2.3</u>	<u>2.6</u>
Maximum effective gain	<u>14.9</u>	<u>15.1</u>

Programme feed: GPO link.

ACKNOWLEDGEMENTS

The mechanical and electrical design construction and setting to work of the aerial were carried out by E.M.I. Electronics Ltd. The contracting authority was the BBC Planning and Installation Department.

REFERENCES

Detailed information on the construction and dimensions of the aerial is given on the following drawings held by Planning and Installation Department:

Band V Panel Aerial: PID SK 15761 H & PID SK 15762 H

Layout of Aerials and Feeders: E.M.I. drawing 9A/D 88699

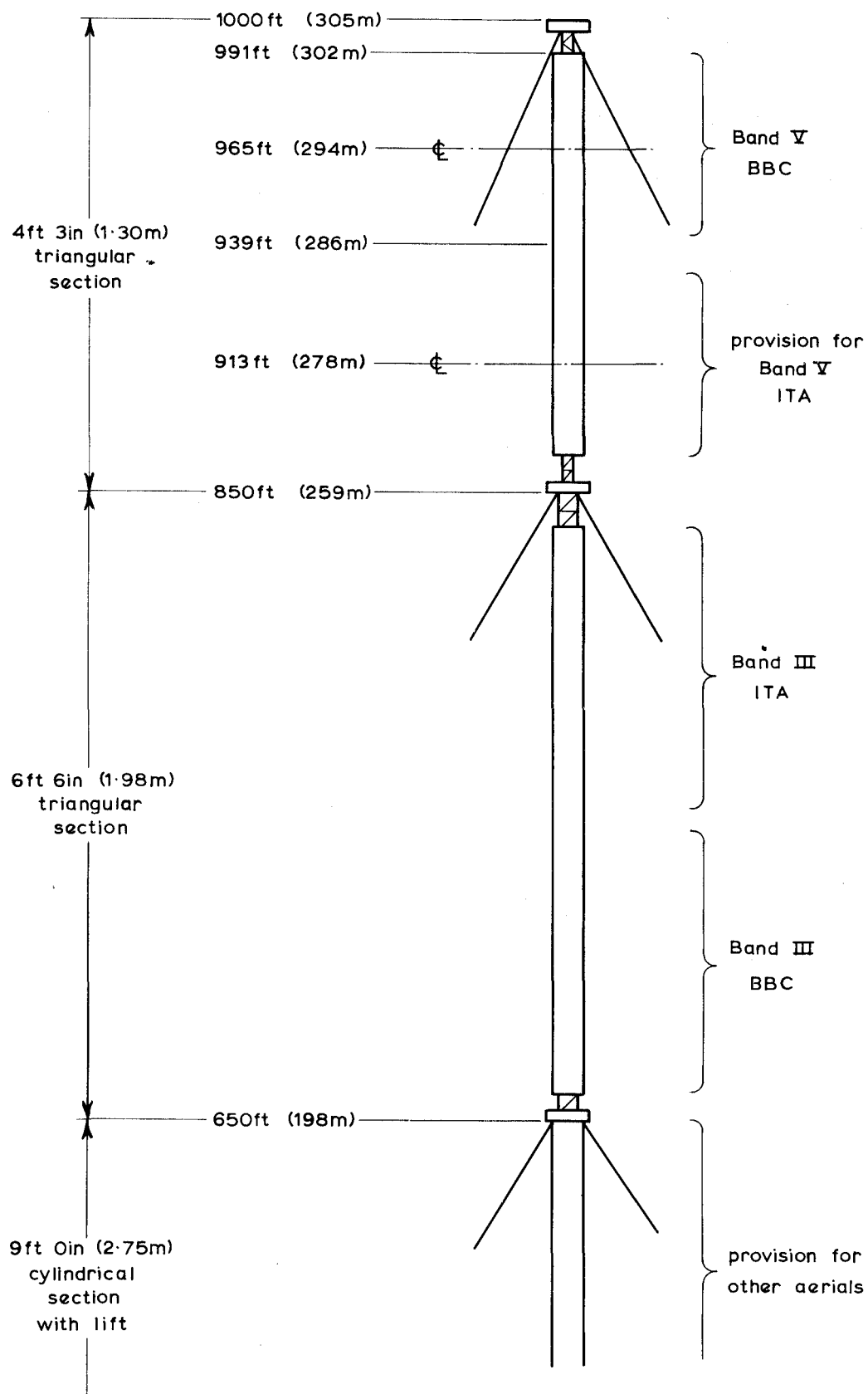


Fig. 1. General arrangement of aërials on mast

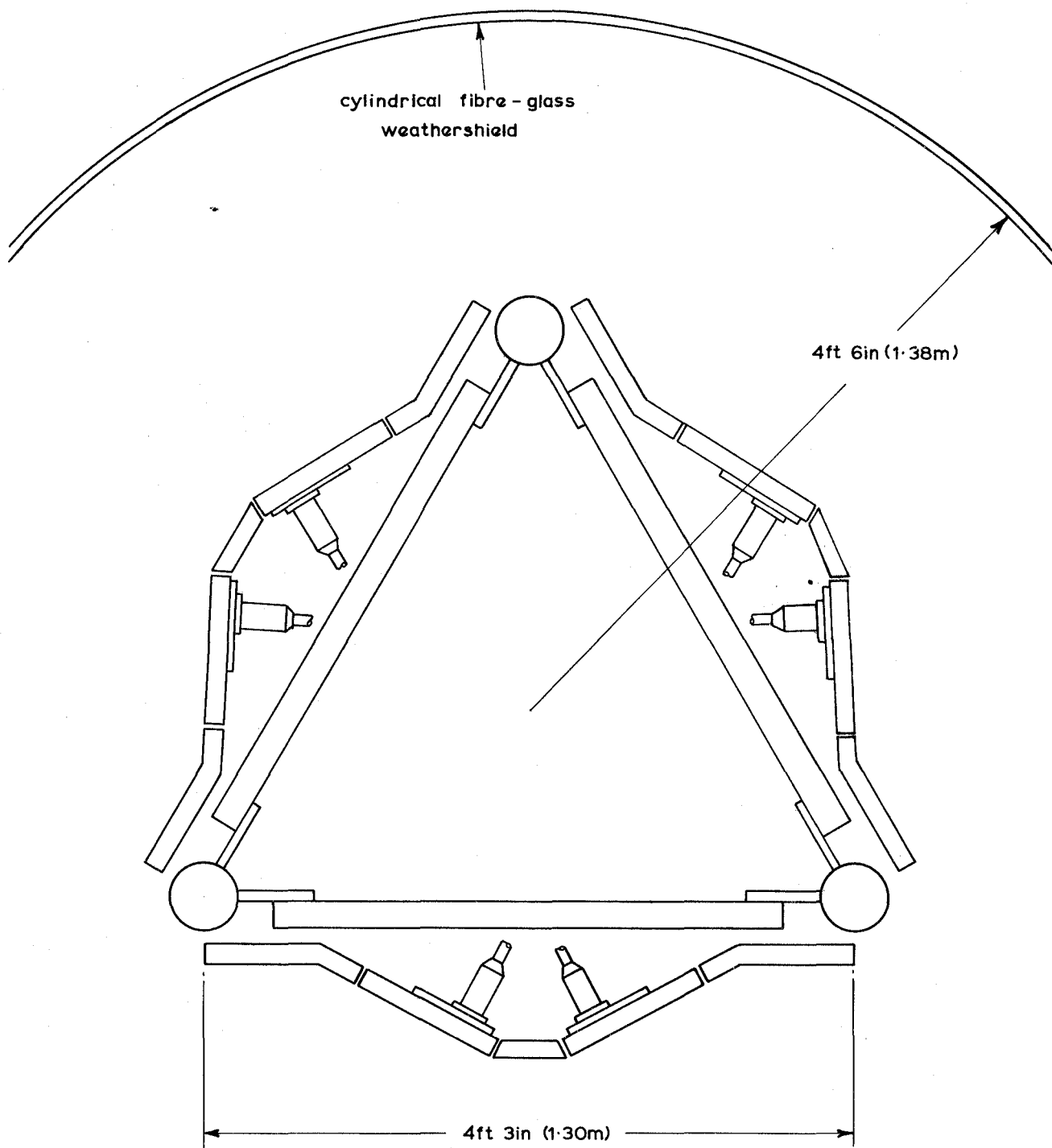


Fig 2. Arrangement of U.H.F. aerial on the support mast.

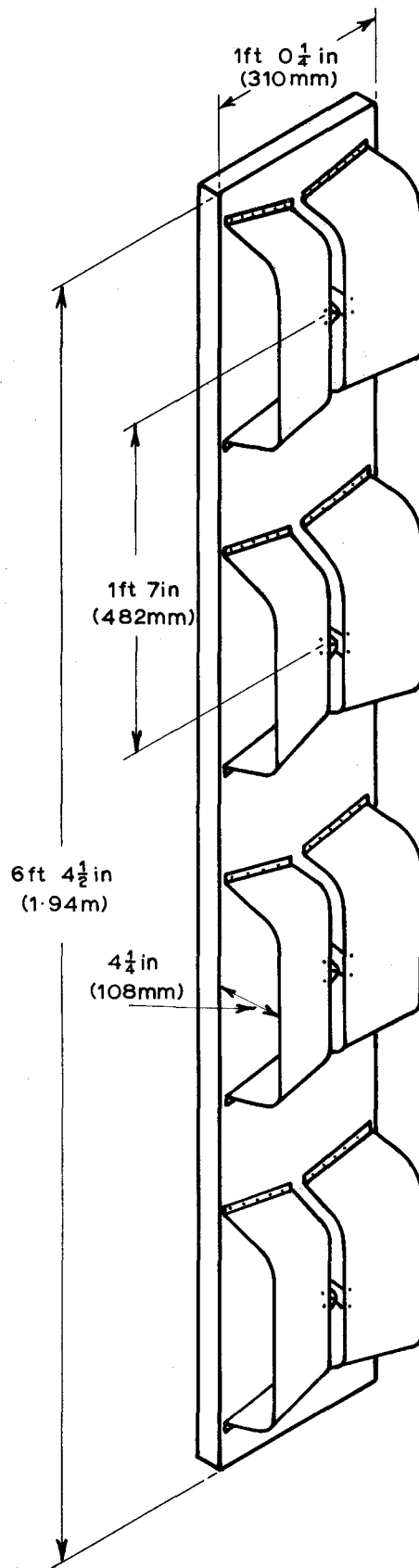


Fig. 3. Construction of aerial panel

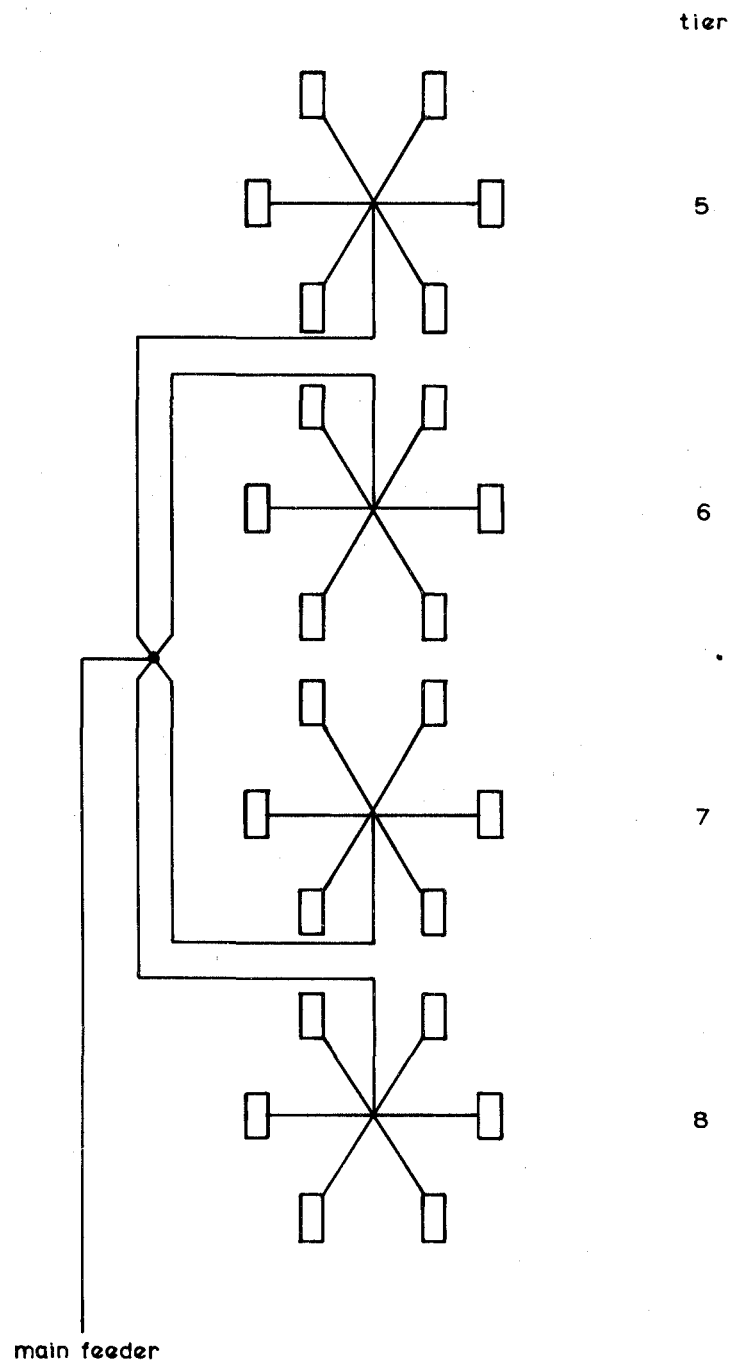


Fig 4. Schematic arrangement of distribution feeder (lower half aerial)

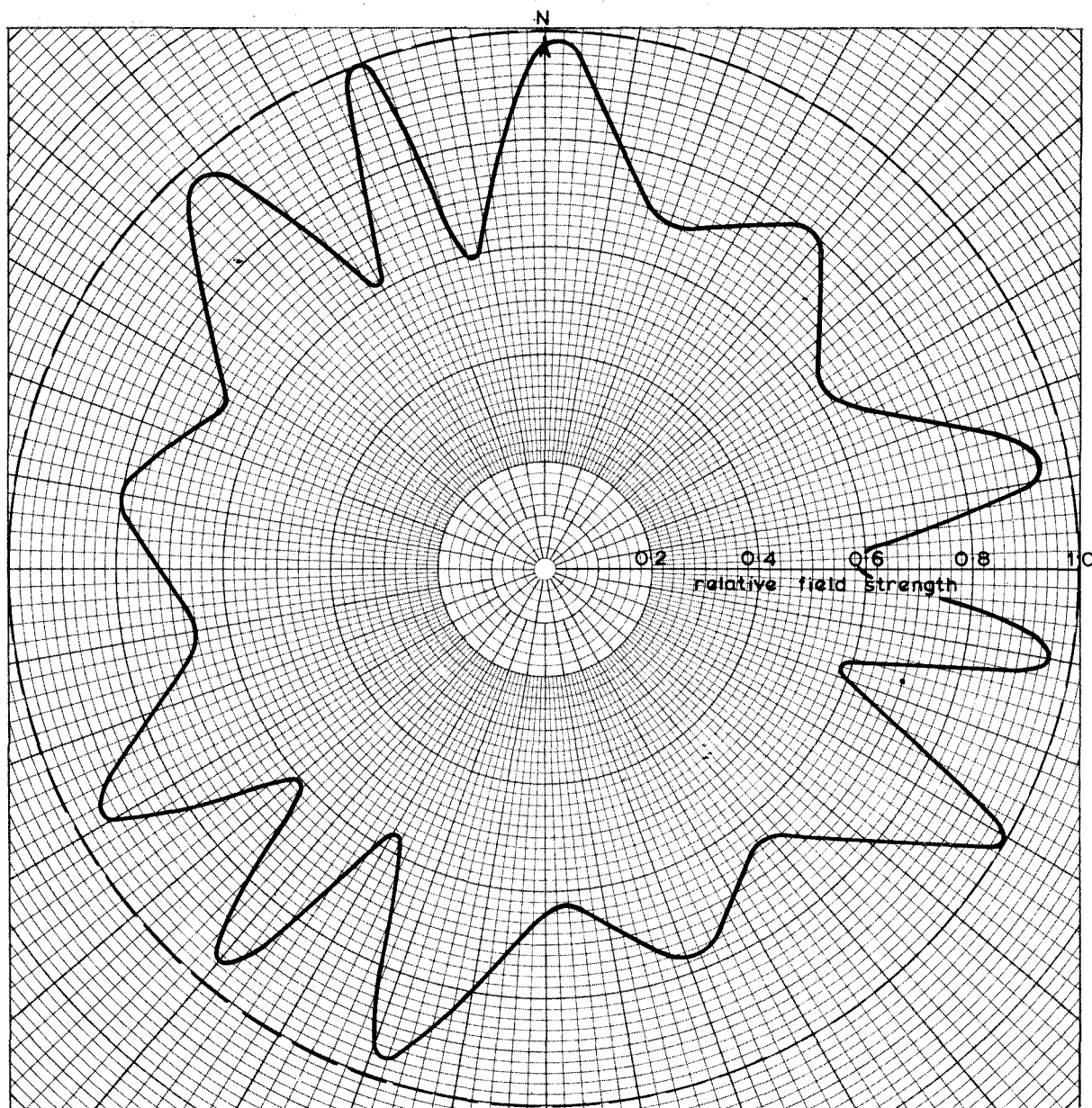


Fig. 5. Horizontal radiation pattern

HORIZONTAL POLARIZATION

Channel 55 (Vision carrier 743.25Mc/s, Sound carrier 749.25Mc/s)

Mean effective gain: 12.6dB — — — Stockholm E.R.P. limit

Peak vision transmitter power: 2 x 8kW

Mean E.R.P.: 290kW

Unit field corresponds to an E.R.P. of 500kW

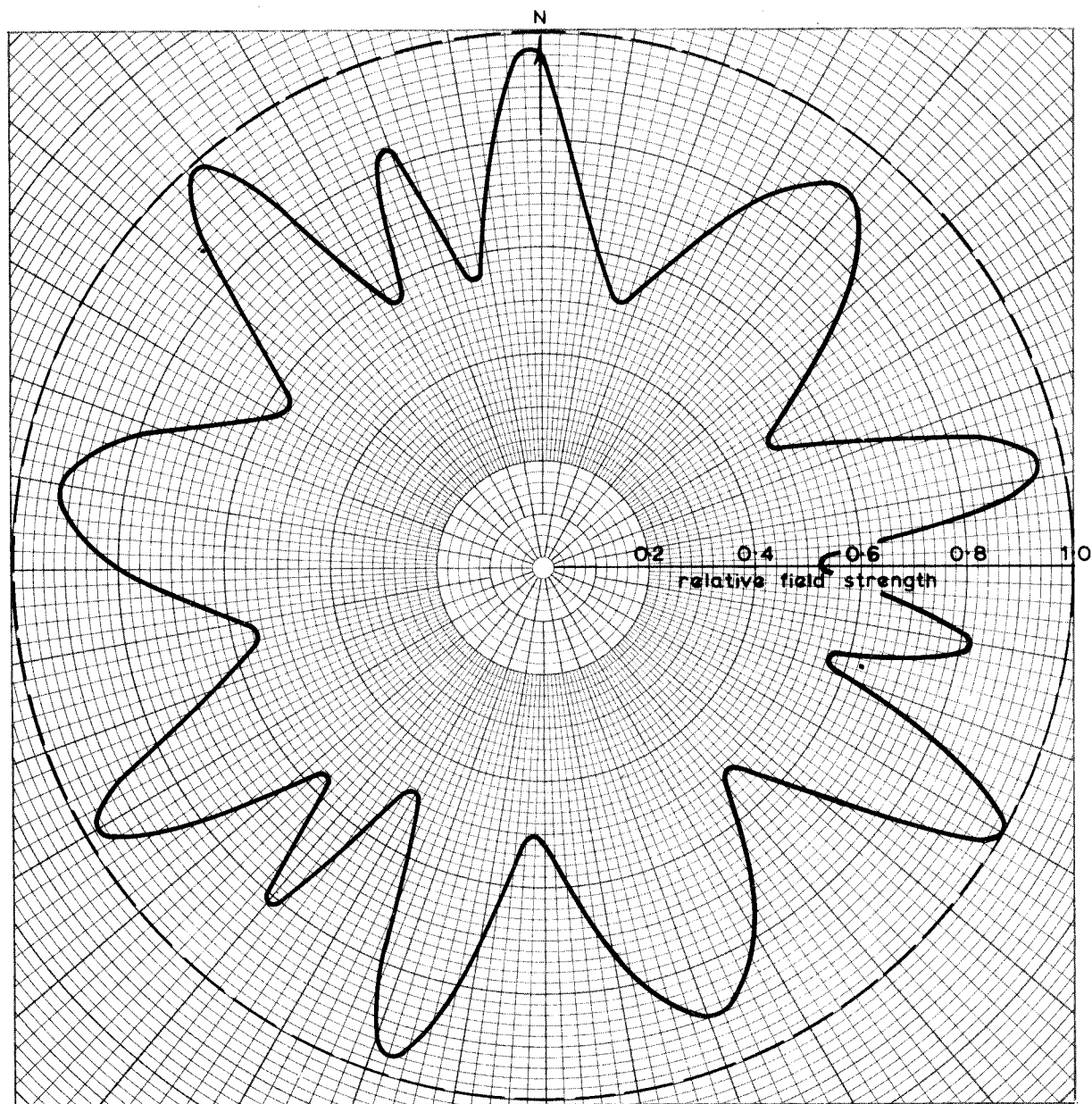


Fig. 6 Horizontal radiation pattern

HORIZONTAL POLARIZATION

Channel 62 (Vision carrier 799.25Mc/s, Sound carrier 805.25Mc/s)

Mean effective gain: 12.5dB

———— Stockholm E.R.P. limit

Peak vision transmitter power: 2 x 8kW

Mean E.R.P.: 280kW

Unit field corresponds to an E.R.P. of 500kW

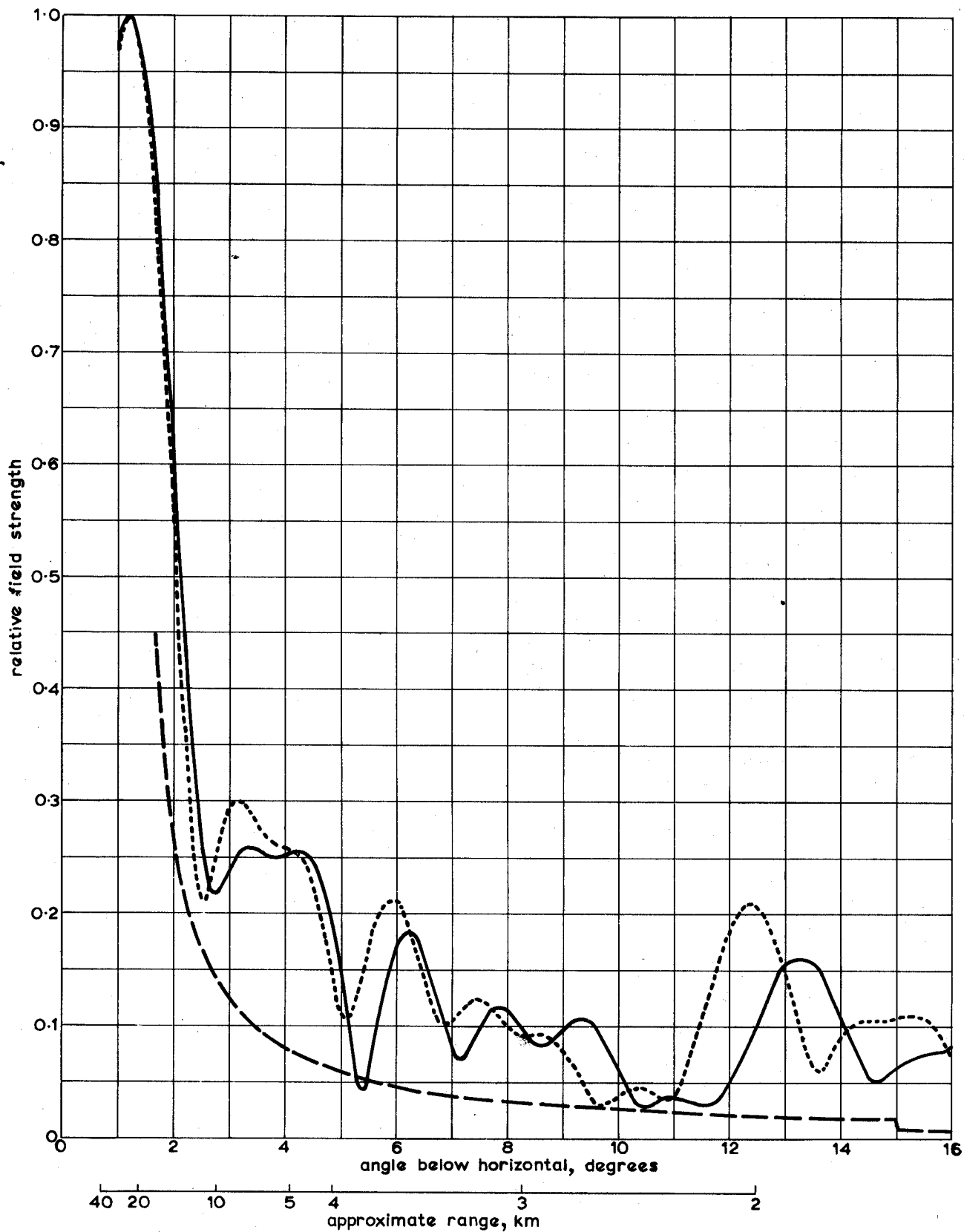


Fig. 7. Vertical radiation pattern on bearing 41° E.T.N.

————— Channel 55 - - - - - Channel 62
 - . - . - Specified minimum field

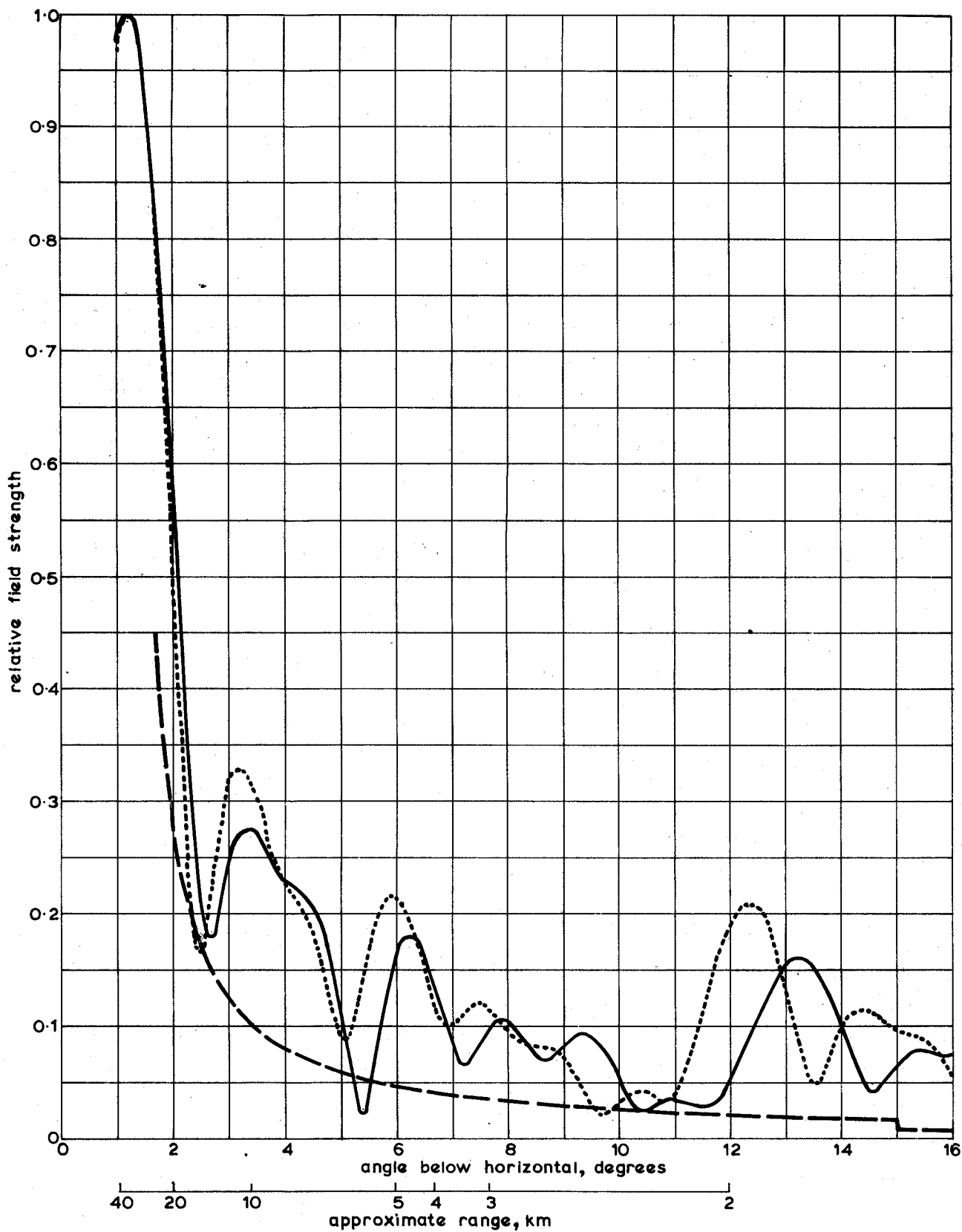


Fig.8. Vertical radiation pattern on bearing 161° E.T.N.

— Channel 55 - - - - - Channel 62
 — — — Specified minimum field

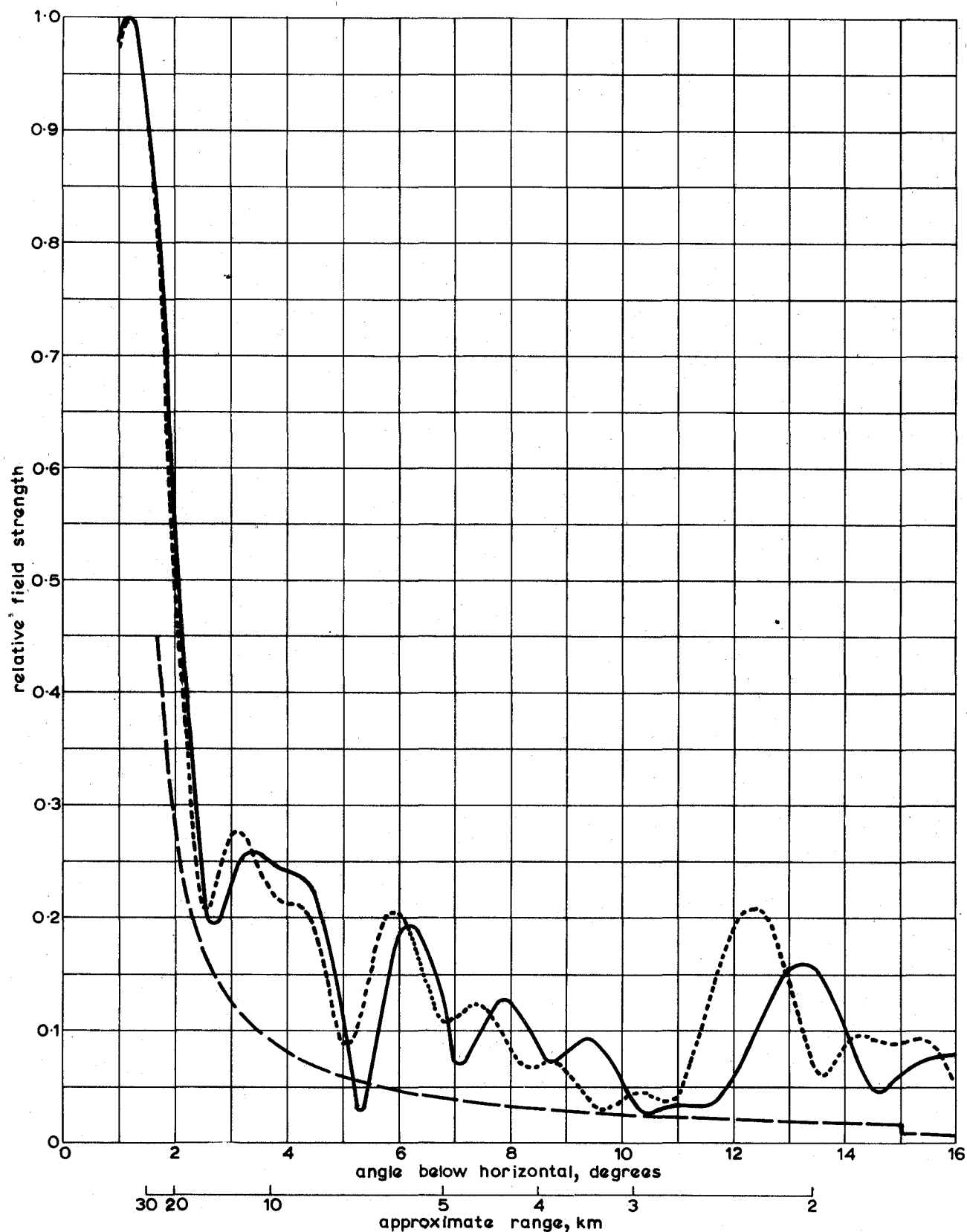


Fig.9. Vertical radiation pattern on bearing 281° E.T.N.

———— Channel 55 - - - - - Channel 62
 - . - . - Specified minimum field